

CLAIMS

What is claimed is:

1. An apparatus for cleaning a surface within a vessel having a vessel wall separating a vessel exterior from a vessel interior and having a wall aperture, the apparatus comprising:
 - an elongate conduit having an upstream first and a downstream second end and positioned to direct a shock wave from the second end into the vessel interior;
 - a source of fuel and oxidizer coupled to the conduit to deliver the fuel and oxidizer to the conduit;
 - an initiator positioned to initiate a reaction of the fuel and oxidizer to produce a detonation wave within the conduit for generating the shock wave; and
 - a source of a purge gas coupled to the conduit to introduce the purge gas to the conduit to drive reaction products of the fuel and oxidizer downstream.
2. The apparatus of claim 1 wherein:
 - the conduit comprises a first portion and a second portion downstream of the first portion;
 - the first portion has a first characteristic cross-sectional area and the second portion has a second characteristic cross-sectional area, greater than the first characteristic cross-sectional area; and
 - the initiator is positioned to initiate a deflagration of the fuel and oxidizer in the first portion, with a deflagration-to-detonation transition from said deflagration producing said detonation wave.
3. The apparatus of claim 1 wherein the source of fuel and oxidizer comprises:
 - a first fuel source of a first fuel;
 - a first oxidizer source of a first oxidizer;
 - a second fuel source of a second fuel; and
 - a second oxidizer source of a second oxidizer.
4. The apparatus of claim 3 wherein:
 - the second fuel and oxidizer sources are coupled to the conduit downstream of where the first fuel and oxidizer sources are coupled.
5. A method for cleaning a surface within a vessel, the vessel having a wall with an

aperture therein, the method comprising:

introducing fuel and oxidizer to a conduit;

initiating a reaction of the fuel and oxidizer so as to cause a shock wave to impinge upon the surface; and

introducing a pressurized purge gas to the conduit.

6. The method of claim 5 performed in a repeated sequential way.
7. The method of claim 5 wherein:
the reaction comprises a deflagration-to-detonation transition.
8. The method of claim 5 wherein:
the purge gas comprises in major portion air.
9. The method of claim 5 wherein:
the purge gas is introduced through a purge gas port in an upstreammost 20% of a flowpath length within the conduit.
10. The method of claim 5 wherein the introduction of the fuel and oxidizer comprises:
introducing a first fuel and a first oxidizer forming a first fuel/oxidizer mixture; and
introducing a second fuel and a second oxidizer forming a second fuel/oxidizer mixture, the second mixture being less detonable than the mixture.
11. The method of claim 10 wherein:
the second oxidizer is less oxygen-rich than the first oxidizer; and
the second fuel/oxidizer mixture is introduced as a mixture.
12. The method of claim 10 wherein:
the second fuel/oxidizer mixture provides a slower reaction chemistry than a reaction chemistry of the first fuel/oxidizer mixture.
13. The method of claim 10 wherein:
a major portion of said first fuel/oxidizer mixture is provided before a major portion of said second fuel/oxidizer mixture is provided.

14. The method of claim 10 wherein:

a major portion of said first fuel/oxidizer mixture is provided after a major portion of said second fuel/oxidizer mixture is provided.